ISSN 2582-788X REVIEW ARTICLE

INTERNATIONAL JOURNAL OF
APPLIED CHEMICAL AND BIOLOGICAL SCIENCES

MOBILE PHONE CONTAMINATION OF HEALTHCARE WORKERS IN HEALTHCARE DELIVERY SYSTEMS: A REVIEW OF LITERATURE FROM VARIOUS COUNTRIES

Satish Bahekar *

Department of pharmacology, Government Medical College, Aurangabad, India

ABSTRACT

Mobile phones have become ubiquitous and inevitable part of every health care worker working any type of health care system. At healthcare sector, they are very commonly used for various purposes routinely (medical and non-medical). But their constant use at healthcare has become source of many bacterial infections, which can be dangerous for the staff as well as for others too. Several studies have been conduct worldwide to explore this important issue. In this review article, this issue is being enlightened by referring some representative studies done globally and have suggested some possible practical measures to overcome it.

Keywords: Health Care Workers, Microbial colonization, Microbes, Smartphones

INTRODUCTION

Mobile communication devices are ubiquitous in modern society of digitalization. Particularly smartphones are very commonly used for various purposes in all areas of healthcare delivery sectors like private & government hospitals, medical colleges, primary health care centres, district health care centres and many more. These serves various purposes like social media use, sharing of medical documents and information, latest medical guidelines, health related local and global news, health related research, communication with colleagues, photography and sharing of medical documents, teleconsultations and patients tracking etc. Because of all these benefits, mobile phones are being extensively used in all healthcare related areas on very much regular basis. Undoubtly there use, improves the overall efficacy and convenience in providing quicker, accurate and mostly updated health care services deliveries.

But, the use of mobile phone in healthcare sector can be dangerous in day to day use. Now, many researchers are proposing the mobile phones as one of the common source of microbial contamination particularly while working in certain areas like, outpatient departments (OPDs), inpatient departments (IPDs), operation theatres (OTs), Intensive Care Units (ICUs) etc. While working in

areas, the use of mobile phones becomes more close proximities of the patients where the risk of pathogenic bacterial transmission increases substantially. There is definitely great possibility of transmission of different types of infective microorganisms through contaminated mobile phones by various direct and indirect routes [1]. Numerous studies have documented regarding the frequent contamination of mobile phones with multiple microorganisms.

But despite the side effect, the ground reality states that the use of mobile phones by health care workers (HCWs) at the facility is unavoidable. However, the mobile phones have emerged as essential part of certain diagnostic fields like medical imaging, telemicroscopy, radiological investigations etc [2]. There usage limitation or even restrictions cannot be possible intervention with any type of relaxations. It has become an absolutely essential work tool for each and every one working in this sector.

Now a days, many HCWs are aware of the possible contamination and spread of infections through mobile phones via various literatures, social medias platforms etc. But, still they seldom clean and disinfectant these device as very few guidelines are published with regard to it.

REVIEW OF LITERATURE

Many documented scientific studies have discussed regarding bacterial contamination by mobile phones of the HCWs while working in different areas of healthcare delivery systems. Chaman R. *et al.* (2018) from Yasuj (Iran) demonstrated in their study about the colonization of mobile phones by multiple pathogenic bacterias like coagulase negative Staphylococcus (CoNS), *Staphylococcus aureus*, *Acinetobacter baumannii* etc [3]. Ulger F. *et al.* (2015) have also postulated that, mobile phones constitute potential risk of bacterial contamination particularly, nosocomial infection which HCWs acquire while working at their workplaces. They proposed that risk of repetitive cyclical contamination between contaminated phones and hands of HCWs is much more dangerous. Additionally, the differences in hand hygiene and individual behaviour also contributes greatly in this cycle. [4]

Mobile phones are ideal breeding sites for all kinds of microorganisms as they get necessary humidity and temperature in pockets, purses, mobile pouches etc. These conditions help the bacteria for their better survival and colonization. These bacteria easily transmitted from the phone to the hands of the person and further transmission gets facilitated in repetitive manner. Not only the common microorganisms, but certain pathogenic bacteria like *Methicillin Resistant Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* also get colonized [5]

Badr RI *et al.* (2012) from Egypt conducted research study in their staff members working in different hospital to determine the potential of mobile phones for harboring microorganisms in hospital environment and evaluated its role in HCW hand transmission. The documented microorganisms were *Coagulase negative Staphylococcus* (CoNS), *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus mirabilis* etc. By using standard microbiological techniques they found that this transmission was positive in 93.70% cases [5].

Datta P *et al.* (2009) from India investigated the rate of bacterial contamination via mobile phones on 200 different HCWs working in tertiary care like OPDs, wards, ICUs, CCUs, burn wards. The results of the study highlighted that total 72% contaminated samples with common microbes like *Methicillin Resistant Staphylococcus Aureus* (MRSA), *Methicillin Sensitive Staphylococcus Aureus* (MSSA), *Coagulase negative*

Staphylococcus (CoNS), *Micrococcus luteus*, *Vidians streptococci*, aerobic spore bearers etc. The use of mobile phones is very common but dangerous with potential threat in hospital infection control practices that could exaggerate the rate healthcare associated infection spread [6].

Ulger F *et al.* (2009) from Turkey also carried out the study to determine contamination rate of 200 HCWs' and contamination transfer via their mobile phones. The rate of infection was found to be 94.5% with some pathogenic bacterias like *Methicillin Resistant Staphylococcus Aureus* (MRSA), *coagulase negative staphylococcus* (CoNS), *Enterococcus faecalis*, coliforms, and some yeasts/molds etc [7]. Akinyemi KO *et al.* (2009) from Nigeria found in their study that about 62% of mobile phones users, particularly food vendors at healthcare facilities are the main source of microbial transmission. *Coagulase negative Staphylococcus* (CoNS) was the most prevalent microorganism in their setup followed by some others like *Pseudomonas aeruginosa*, *Escherichia coli*, *Enterococcus faecalis* and *Klebsiella pneumoniae* etc. at the facility [8].

Yi Chao Foong *et al.* (2015) from Australia conducted the screening programme of 220 staff members from regional Australian hospital to investigate the potential role of mobile phones as reservoirs of bacterial colonies. In their report, they stated that 72% of contamination like *Coagulase negative Staphylococcus* (CoNS) followed by others like *Bacillus thuringiensis*, non-haemolytic streptococci, *Corynebacterium diphtheria*, coliforms, *Methicillin Resistant Staphylococcus Aureus* (MRSA) etc. were observed [9]. This report shows that pathogenic microbes can easily be transmitted via mobile phones.

Bhat SS *et al.* (2011) from India conducted a study to determine the incidence of bacterial colonization by mobile phones on 204 HCWs working in various medical and dental departments of teaching institute of Mangalore, India. After completion of screening, they found that 99% of mobile phones were having incidence of bacterial contamination including *Methicillin Resistant Staphylococcus Aureus* (MRSA), *Methicillin Sensitive Staphylococcus Aureus* (MSSA), *escherichia coli*, *enterococcus faecalis*, *klebsiella pneumoniae*, acinetobacter & *pseudomonas aeruginosa*. On comparison, it was found that the contamination rate was little bit higher in HCWs working in medical departments than those working in dental departments [10].

Ramesh J *et al.* (2008) conducted research study to document the potential risk of bacterial contamination by mobile phones on 266 HCWs working in Caribbean setting. They documented 45% of bacterial contamination rate with the highest incidence of *Staphylococcus epidermidis*, coliforms, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Enterobacter cloacae* and *Klebsiella pneumonia* [11]. Sharma K *et al.* (2017) from India carried out the research study at the tertiary care teaching hospital of Jammu & Kashmir to determine the rate of bacterial contamination via mobile phones of 100 HCWs working in their hospital set up and to study their antibiogram. They reported 60% HCWs' mobile phones were contaminated by various microorganisms with predominance of *Staphylococcus aureus*, followed by *Coagulase negative staphylococcus* (CoNS), *Pseudomonas aeruginosa*, *Escherichia coli, Klebsiella pneumonia*, Acinetobacter species and Bacillus species. [12]

Rozario SR *et al.* (2019) from Bangladesh conducted the research study on 268 volunteer with different occupation like medical students, security staff, food vendors and cleaning staff) from University of Dhaka to determine the potential pathogens and multiple drug resistant (MDR) bacteria from their mobile phone surfaces. Additionally, they also explored the

possible relationship between the use to mobile phone during meal and using in toilets. In both the cases, they found mobile phones were found contaminated with various pathogens of enterobacter species and even multiple drug resistant (MDR) bacteria [13].

Banawas Saeed *et al.* (2018) from Saudi Arabia investigated bacterial contamination by mobile phones of 285 HCWs in three different hospitals. They reported total 63% mobile phones contamination out of which 38.3% were contaminated with *Coagulase negative staphylococcus* (CoNS) while other microorganisms detected were *Staphylococcus aureus, Staphylococcus hominis, Vibrio fluvialis*, Pseudomonas etc. Also most of the samples were found to be resistant to common antibiotics [14].

Debnath *et al.* (2018) from Bangladesh conducted the study to investigate the prevalence of microbiological contamination by mobile phones of clinicians in hospitals. From 100 samples, 69% were found contaminated with various microbes like *Staphylococcus aureus, Pseudomonas, Escherichia coli, Staphylococcus epidermidis, Salmonella typhi* etc. After doing antibiotic sensitivity, most of the isolates were found resistant to common antibiotics like Azithromycin, Gentamycin, Tetracyclines and even to higher ones like Imipenam [15].

Kilic IH *et al.* (2009) from Turkey conducted research study to investigate microbial colonization of HCWs' mobile phones from three hospitals. They reported 61.5% of contamination with *Staphylococcus epidermidis, Staphylococcus aureus, Bacillus cereus*, Corynebacterium species and *Escherichia coli* etc [16]. Mark D *et al.* (2014) from United Kingdom conducted research on multidisciplinary team of 150 HCWs working in surgical wards of multispecialty hospital. They recorded 60% of contaminated cases with some common bacteria like *Coagulase negative staphylococcus* (CoNS), *Viridans streptococci*, Corynebacterium and Bacillus species etc [17].

CONCLUSION

From the above mentioned studies, carried out in different countries with their different healthcare set ups and standards, we can easily predict that irrespective of countries the problem of mobile phone contamination of health care workers is very much common and almost unavoidable. There are other multiple studies carried out and being carried in various other countries, as this issue is much common but serious. It is not possible to mention each and every study but, the common inference that can be drawn is that, the mobile phones of HCWs are potential vector of many common and uncommon microbes which build serious thread to infection control programs of all healthcare related sectors. They can be main source of contamination spread at most hospital. However, by keeping in mind the unavoidable and beneficial use of mobile phones, all possible effective preventive strategies should be adopted to minimize these types of contaminations. These includes regular decontamination of mobile phones with alcohol based disinfectant wipes combined with strong hand hygiene measures while working in health care system. Particularly hand hygiene at work places is greatly overlooked and underemphasized in health care sector which can be the mighty factor in this regard. Other measures that can be suggested for this issue can be production of new generation mobile phones with hand free features which can minimize hand contact, blue tooth operated mobile accessories, antibacterial surface covers, waterproof and washable mobile phones and most important can be the production of more specific antibacterial solutions.

ACKNOWLEDGEMENT

NA

REFERENCES

1. Graveto JM, Costa PJ, Santos CI (2018). Cell phone usage by health personnel: preventive strategies to decrease risk of cross infection in clinical context, *Texto Contexto Enferm*; 27

2. Mukund Bahadur KC, Murray PJ (2010). Cell phone short messaging service (SMS) for HIV/AIDS in South Africa: a literature review, *Studies in Health Technology and Informatics*; **160**:530-534.

3. Chaman R, Nargeseyan S, Jannesar R, Ravangard S, Nikbakht G (2018). Survey of prevalence and types of bacterial contamination of mobile phones of personnel employed in major wards of educational hospitals in Yasuj, *Journal of Fundamental Applied Sciences*; **10**:449-458.

4. Ulger F, Dilek A, Esen S, Sunbul M, Leblebicioglu H(2015). Are healthcare workers' mobile phones a potential source of nosocomial infections? Review of the literature, *Journal of Infection in Developing Countries*; **9(10)**: 1046-1053.

5. Badr RI, Badr HI, Ali NM (2012). Mobile phones and nosocomial infections, *International Journal of Infection Control*; **8(12)**: 1-5.

6. Datta P, Rani H, Chander J, Gupta V(2009). Bacterial contamination of mobile phones of health care workers, *Indian Journal of Medical Microbiology*; **27**:279-81.

7. Ulger F, Esen S, Dilek A, Yanik K, Gunaydin M, & Leblebicioglu H (2009). Are we aware how contaminated our mobile phones with nosocomial pathogens?. *Annals of clinical microbiology and antimicrobials*; **8(1)**:7

8. Akinyemi KO, Atapu AD, Adetona OO, Coker AO (2009). The potential role of mobile phones in the spread of bacterial infections, *Journal of Infection in Developing Countries*; **3(8)**: 628-632.

9. Foong YC, Green M, Zargari A, Siddique R, Tan V, Brain T, & Ogden K (2015). Mobile phones as a potential vehicle of infection in a hospital setting. *Journal of occupational and environmental hygiene*; **12(10)**: D232-D235.

10. Bhat SS, Hegde SK, Salian S (2011), Potential of Mobile Phones to Serve as a Reservoir in Spread of Nosocomial Pathogens, *Online Journal of Health Allied Sciences*; **10(2)**:14-16.

11. Ramesh J, Carter AO, Campbell MH, Gibbons N, Powlett C, Moseley Sr, H. & Carter T (2008). Use of mobile phones by medical staff at Queen Elizabeth Hospital, Barbados: evidence for both benefit and harm. *Journal of Hospital Infection*; **70(2)**: 160-165.

12. Sharma K, Najotra D.K, Slathia P, Raina S (2017), Microbiological flora of cell phones: a reservoir of potential pathogens?, *International Journal of Medical Research and Review*; **5(02)**:204-208.

13. Rozario SR, Rahman H, Fakhruddin ANM, Rabbani KA (2019), Prevalence of Multidrug-Resistant Bacteria on Mobile Phone Surface, *Journal of Microscopic Ultrastructure*; **8(1)**:14-19.

14. Banawas S, Abdel-Hadi A, Alaidarous M, Alshehri B, Bin Dukhyil AA, Alsaweed M, & Aboamer M. (2018). Multidrug-resistant bacteria associated with cell phones of healthcare professionals in selected hospitals in Saudi Arabia. *Canadian Journal of Infectious Diseases and Medical Microbiology*; 2018.

15. Debnath T, Bhowmik S, Islam T, Hassan Chowdhury MM (2018), Presence of multidrug-resistant bacteria on mobile phones of healthcare workers accelerates the spread of nosocomial infection and Regarded as a Threat to Public Health in Bangladesh, *Journal of Microscopic Ultrastructure*; **6**:165-9.

16. Kilic IH, Ozalsan M, Karagoz ID, Zer Y, Davutoglu V (2009). The Microbiolgical Colonization of Mobile Phone Used by Healthcare Staff, *Pakistan Journal of Biological Scienc.*; **12(11)**: 882-884.

17. Mark D, Leonard C, Breen H, Graydon R, O'Gorman C, & Kirk S (2014). Mobile phones in clinical practice: reducing the risk of bacterial contamination. *International journal of clinical practice,* **68(9),** 1060-1064.